



UNITED STATES PATENT AND TRADEMARK OFFICE

abn
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER OF PATENTS AND TRADEMARKS
Washington, D.C. 20231
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,186	02/14/2001	Gerd Schneider	21295/21	8480

7590

12/19/2002

Maria Eliseeva, Esq.
Brown, Rudnick, Freed & Gesmer
One Financial Center
Boston, MA 02111

EXAMINER

KAO, CHIH CHENG G

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 12/19/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/681,186

Applicant(s)

SCHNEIDER ET AL.

Examiner

Chih-Cheng Glen Kao

Art Unit

2882

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☒ Claim(s) 1,4,5 and 9 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 February 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4. 6) ☐ Other: .

Art Unit: 2882

DETAILED ACTION

Drawings

1. The drawings are objected to because partial views intended to form one complete view, on one or several sheets, must be identified by the same number followed by a letter. View numbers must be preceded by the abbreviation "FIG. ". This objection may be obviated by labeling Fig. 2b, 2c, and 2d as shown on Page 15, paragraphs 61-63, to the drawings.

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description:

Fig. 5, #15

A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

3. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description:

"optical axis 28" on Page 17, line 1

"segments 26, 27" on Page 20, line 11

Art Unit: 2882

A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

4. The drawings are objected to because Figure 3a appears to be chopped off after reference #9 on the right side of the paper. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

5. The disclosure is objected to because of the following informalities: On Page 6, paragraph 21, the specification refers to claims. Any possible amendment to the claims may make this information inaccurate. This objection may be obviated by deleting the paragraph. Appropriate correction is required.

Claim Objections

6. Claim 1 is objected to because of the following informalities: Claim 1 recites the limitation "the transmission" in line 7. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

Art Unit: 2882

7. Claim 4 is objected to because of the following informalities: Claim 4 recites the limitation "the Rayleigh-Gans algorithms" in line 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

8. Claim 5 is objected to because of the following informalities: Claim 5 recites the limitation "the examination of metal structures", "the vicinity", and "the corresponding absorption discontinuities" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting those particular instances of "the". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

9. Claim 5 is objected to because of the following informalities: Claim 5 recites the limitation "the examination of metal structures", "the vicinity", and "the corresponding absorption discontinuities" in lines 2-3. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting those particular instances of "the". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

10. Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation "the back focal plane" in line 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting "a". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

Art Unit: 2882

11. Claim 9 is objected to because of the following informalities: Claim 9 recites the limitation "the X-ray objective" in line 2. There is insufficient antecedent basis for this limitation in the claim. This objection may be obviated by deleting "the" and inserting "an". For purposes of prosecution, the claim will be treated as such. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1, 6, 8, 9, 12, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. (US Patent 5222113) in view of Suckewer et al. (US Patent 5177774), Nagai et al. (US Patent 5533083), Schmahl et al. ("Proposal for a phase contrast x-ray microscope").

Thieme et al. discloses a method and x-ray microscope (Title) for examining a structure (Fig. 1, #4) comprising penetrating and imaging with x-rays (Fig 1) with an objective (col. 1, lines 40-45, and col. 3, lines 40-45), which impinges radiation at all sides (Fig. 1), and a condenser (Fig. 1, #3).

However, Thieme et al. does not disclose examining structures on a semiconductor substrate, imaging on a spatially resolving detector, establishing a wavelength or range as a function of the thickness of the sample operating in phase contrast, and a segmented phase plate.

Suckewer et al. teaches examining structures on a semiconductor substrate (col. 4, lines 53-60). Nagai et al. teaches imaging on a spatially resolving detector (col. 2, lines 5-18).

Art Unit: 2882

Schmahl et al. teaches establishing a wavelength or range as a function of the thickness of the sample operating in phase contrast (Page 231, 2nd half of page, Equation 16.1, and Page 235, last 4 lines) and a segmented phase plate (Fig. 16.1).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to examine structures on a semiconductor substrate of Suckewer et al. with the method and device of Thieme, since the inspection of biological and semiconductor structures were art-recognized equivalents at the time the invention was made. Thus, one of ordinary skill in the art would have found it obvious to examine a biological structure or a semiconductor structure. One would be motivated to examine a semiconductor structure with x-rays in order to observe the very fine details as implied from Suckewer et al. (col. 4, lines 53-60).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to image with spatially resolving detectors of Nagai et al. with the method and device of Thieme, since one would be motivated to secure images of various data as implied from Nagai et al. (col. 2, lines 5-18).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to establish a wavelength or range as a function of the thickness of the sample of Schmahl et al. with the method and device of Thieme, since one would be motivated to obtain high resolution as implied from Schmahl et al. (Page 236, lines 5-13) for a better image.

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the segmented phase plate of Schmahl et al. with the method and device of Thieme, since one would be motivated use it for amplifying the image as implied from Schmahl et al. (Page 233, lines 1-2).

Art Unit: 2882

13. Claim 2 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. as applied to claim 1 above, and further in view of Levine et al. ("Tomographic reconstruction of an integrated circuit interconnect").

Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. suggests a method as recited above.

However, Thieme et al. does not disclose reducing the thickness of a substrate to examine metal structures by tomographic reconstruction.

Levine et al. teaches reducing the thickness of a substrate (Abstract, lines 1-2) to examine metal structures (Page 150, col. 2, lines 1-2) by tomographic reconstruction (Title).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to reduce the thickness of a substrate of Levine et al. with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., since one would be motivated to image just the important features of a structure as implied from Levine et al. (Page 150, col. 1, last line, and col. 2, lines 1-11).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have tomographic reconstruction of Levine et al. with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., since one would be motivated to image in 3 dimensions as implied from Levine et al. (Page 150, col. 1, lines 1-3), which will reveal more information than a two-dimensional image.

Art Unit: 2882

14. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. as applied to claim 1 above, and further in view of Levine et al. and Schneider ("Cryo x-ray microscopy with high spatial resolution in amplitude and phase contrast").

Thieme et al. in view of Suckewer et al., Nagai et al., Schmahl et al. suggests a method as recited above.

However, Thieme et al. does not disclose less than 30um thickness and x-radiation wavelength between 0.1 to 2nm.

Levine et al. teaches less than 30um thickness (Abstract, lines 1-2). Schneider teaches x-radiation wavelength of about 2nm (Abstract, line 10) or 0.3 nm (Page 86, col. 2, 2nd paragraph).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have less than 30um thickness of Levine et al. with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., since one would be motivated to image just the important features of a structure as implied from Levine et al. (Page 150, col. 1, last line, and col. 2, lines 1-11).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have wavelength between 0.1 to 2 nm of Schneider with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. and Levine et al., since one would be motivated to use smaller wavelengths to actually see smaller structures as implied from Schneider (Abstract, line 10).

Also note that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. One would be

Art Unit: 2882

motivated to use these thickness and length values to obtain high resolution as implied from Schmahl et al. (Page 236, lines 5-13) for a better image.

15. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. as applied to claim 1 above, and further in view of Schneider (Dissertation).

Thieme et al. in view of Suckewer et al., Nagai et al., Schmahl et al. suggests a method as recited above.

However, Thieme et al. does not disclose wavelength selected by Rayleigh-Gans algorithms for scattering.

Schneider teaches wavelength selected by Rayleigh-Gans algorithms for scattering (Page 1, lines 8-14).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have wavelength selected by Rayleigh-Gans algorithms for scattering of Schneider with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., since one would be motivated to use this phase information derived from Rayleigh-Gans algorithms to operate at even shorter wavelengths as implied from Schneider (Page 2, lines 4-6), which is advantageous for viewing even smaller structures.

16. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. as applied to claim 1 above, and further in view of Levine et al. and Schneider (Dissertation).

Art Unit: 2882

For purposes of being concise, Thieme et al. in view of Suckewer et al., Nagai et al., Schmahl et al., and Levine et al. suggests a method as recited above.

However, Thieme et al. does not disclose wavelengths based on absorption discontinuities.

Schneider teaches wavelength based on absorption discontinuities (Page 2, lines 1-4).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have wavelength based on absorption discontinuities of Schneider with the suggested method of Thieme et al. in view of Suckewer et al., Nagai et al., Schmahl et al., and Levine et al., since one would be motivated to use the absorption discontinuities or windows to obtain good amplitude contrast as implied from Schneider (Page 2, lines 1-4) for a better image.

17. Claims 10 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al. ('083), and Schmahl et al., as applied to claims 9 and 13 above, and further in view of Nagai et al. (US Patent 5434901).

Thieme et al. in view of Suckewer et al., Nagai et al. ('083), and Schmahl et al. suggests a method and device as recited above.

However, Thieme et al. does not disclose a segmented stop before a condenser.

Nagai et al. ('901) teaches a segmented stop before the condenser (Fig. 3B, #22b and 22).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to segmented stop before the condenser of Nagai et al. ('901) with the suggested method and device of Thieme et al. in view of Suckewer et al., Nagai et al. ('083), and

Art Unit: 2882

Schmahl et al., since one would be motivated to have a stop before the condenser to control or isolate light (Fig. 3B) as implied from Nagai et al. ('901) into the condenser, which creates less interference in the signal.

18. Claims 11 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., as applied to claims 9 and 13 above, and further in view of Schmal et al. (US Patent 5550887).

Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al. suggests a method and device as recited above.

However, Thieme et al. does not disclose a segmented annular condenser zone plate used as a condenser.

Schmal et al. teaches a segmented annular zone plate as the condenser (col. 2, lines 45-50).

It would have been obvious, to one having ordinary skill in the art at the time the invention was made, to have the zone plate of Schmal et al. with the suggested method and device of Thieme et al. in view of Suckewer et al., Nagai et al., and Schmahl et al., since one would be motivated to use it to focus the x-ray radiation on the sample as implied from Schmal et al. (col. 2, lines 44-46).

Art Unit: 2882

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chih-Cheng Glen Kao whose telephone number is (703) 605-5298. The examiner can normally be reached on M - Th (8 am to 5 pm).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Kim can be reached on (703) 305-3492. The fax phone numbers for the organization where this application or proceeding is assigned are 703-872-9318 for regular communications and 703-872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



gk
December 15, 2002



ROBERT H. KIM
SUPERVISOR, PATENT EXAMINER
TECHNOLOGY CENTER 2800